Ordering number : EN4036A

Monolithic Linear IC



No. 4036A

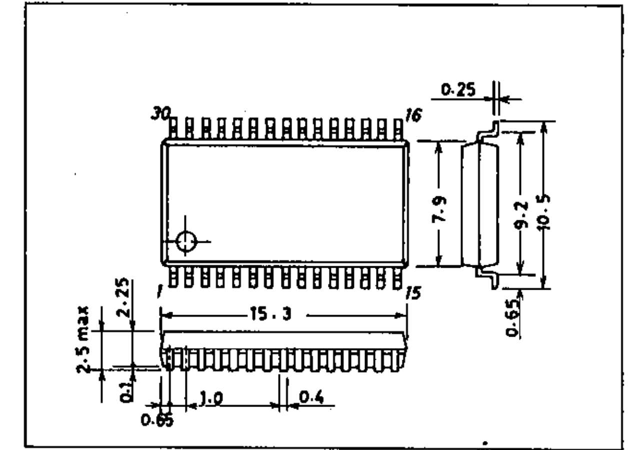
LA4167M

1-channel Record/Playback System for Microcassette and Compact Cassette Recorders

Package Dimensions

unit : mm

3073A – MFP30S



The LA4167M is a record/playback system IC supporting microcassette and compact cassette recorders. This is a high-performance IC that has on-chip a governor circuit for motor control, a voice sensor circuit that detects sounds and switches the motor on and off, and a cue-tone circuit for instantly finding the desired segment to play back.

Functions

- Microphone and playback preamps
- Record amplifier
- Power amplifier (BTL 4 Ω — single power during recording)
- Cue-tone oscillator and current amplifier (15 Hz typ. sine wave)
- Governor circuit
- Microphone power supply
- LED drive

Features

- Can switch between recording and playback with a single mechanical switch.
- Pause switch can switch the governor on and off.
- Cue-tone switch can record specified oscillator output (sine wave) during recording.
- The governor can automatically be switched on or off according to the mike input level during recording, and the on/off level for the governor can be varied continuously by the external volume control (used to adjust volume during playback).
- Mike monitor level is continuously variable.
- LED pin for turning off the LED only when cue-tone is on.

Maximum Ratings at Ta = 25°C

			unit
Maximum supply voltage	V_{CC} max	4.5	V
Allowable power dissipation	Pd max	800	mW
Operating temperature	Topr	–10 to +50	°C
Storage temperature	Tstg	–55 to +150	°C

Operating Conditions at Ta = 25°C

			unit
Recommended supply voltage	V_{CC}	3.0	V
Power supply voltage operating range	V_{CC} op	1.8 to 3.6	V
Resistance load (power)	R_L pwr	4	Ω
Resistance load (preamp)	R_L pre	10	kΩ

Operating Characteristics at Ta = 25°C, V_{CC} = 3.0 V, R_L = 4Ω (power), R_L = 10 kΩ (preamp), f = 1 kHz, 0 dBm = 0.775 V PLAY mode during BTL, REC mode during single

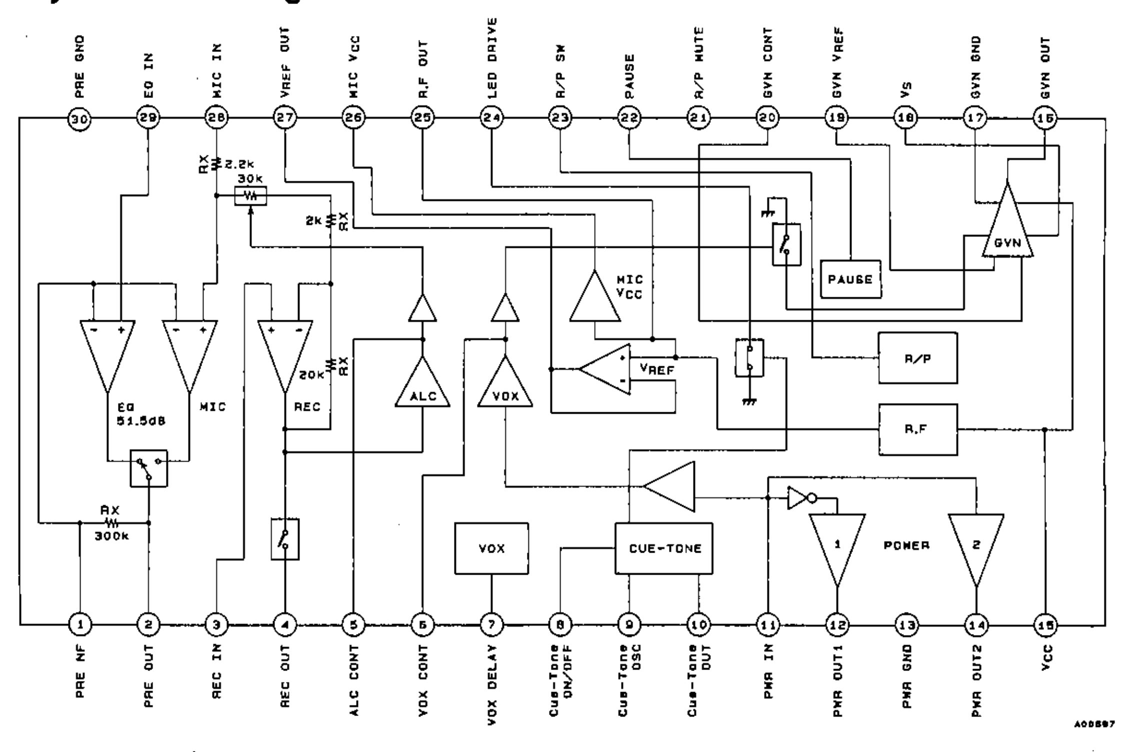
			min	typ	max	unit
[Pre + Power + GVN]						
Silence current	$I_{CC\text{-}R}$	REC MODE, Vi=0V	6	12	18	mA
	$I_{CC\text{-}P}$	PLAY MODE, Vi=0V	12	18	25	mA
[Pre + Power]						
Voltage gain	VG_{TP}	PLAY MODE, V_O=–5dBm	72	74.5	77	dB
[EQ AMP]						
Voltage gain (open)	VG_{OP}	C_{NF}=100μF	80	85	90	dB
Voltage gain (closed)	VG_P		49.5	51.5	53.5	dB
Maximum output voltage	V_{OP} max	THD=1%	0.5	0.75	1.0	V
Total harmonic distortion	THD_P	V_O=0.3V	0.01	0.2	0.6	%
Input conversion noise voltage	V_{NIP}	Rg=2.2kΩ, DIN AUDIO		1.0	2.0	μV
Ripple rejection	Rrp	Rg=2.2kΩ, f_R=1kHz, 1kHz Filter	45	60		dB
[MIC AMP]						
Voltage gain (open)	VG_{OM}	C_{NF}=100μF	75	80	85	dB
Voltage gain (closed)	VG_{MI}	EQ parameter ON, 3k, 3300pF IN	44	46	48	dB
Maximum output voltage	V_{OMAXM}	THD=1%, R_L=10kΩ	0.5	0.75	1.0	V
Total harmonic distortion	THD_M	V_O=0.3V	0.01	0.6	1.0	%
Input conversion noise voltage	V_{NIM}	Rg=2.2kΩ, DIN AUDIO		1.0	2.0	μV
Ripple rejection	Rr_M	Rg=2.2kΩ, f_R=1kHz, 1kHz Filter	45	65		dB
Input resistance	R_{IM}		24	32	40	kΩ
[MIC + REC]						
Voltage gain (closed)	VG_{RT}	Vol min	64.5	66.5	68.5	dB
Maximum output voltage	V_{OMAXR}	THD=5%	0.6	1.0	1.3	V
Total harmonic distortion	THD_{RT}	V_O=0.85V	0.5	1.2	2.0	%
Output noise voltage	V_{NORT}	MIC input, Rg=2.2kΩ, DIN AUDIO		5.0	10	mV
Ripple rejection	Rr_{RT}		38	45		dB
[POWER AMP]						
Voltage gain (open)	VG_{BTL}	BTL ON, V_O=–10dBm	21.5	24	26.5	dB
Voltage gain (closed)	VG_{SIN}	BTL OFF, V_O=–10dBm	20.5	23	25.5	dB
Output power (BTL)	P_{OBTL}	THD=10% BTL	200	350	500	mW
Output power (SIN)	P_{OSIN}	THD=10% Single	50	120	250	mW
Total harmonic distortion	THD_{BTL}	BTL ON, V_O=0.25V	0.1	0.8	2	%
Output noise voltage	V_{NOBTL}	BTL ON, Rg=0	10	20	50	μV
Ripple rejection	Rr_{BTL}	BTL ON, Rg=0, f_R=1kHz, 1kHz Filter	50	70		dB
Output DC offset	$V_{DC\,OFF}$		0	10	50	mV
Input resistance	R_{INBTL}		21	30	39	kΩ
[ALC]						
ALC width	ALC W	Input level width when output distortion is 5% and ALC is on	40	50	65	dB
ALC distortion	ALC THD	Vim=–40dBm	0.1	1.5	2.5	%
ALC output	ALC V_O	Vim=–40dBm	0.35	0.45	0.55	V
ALC input on	ALC V_{IN}		–75	–70	–65	dB
[Voice sensor (VOX)]						
Operation start input voltage	V_{OP} min	VOLUME (10kΩ) max	–93	–90	–87	dB
Input hysteresis	$V_{O\,HL}$		3	6	9	dB
[Oscillator]						
Oscillation frequency	f_{OSC}	c_{OSC}=0.47μF	13.5	15	16.5	Hz
[LED]						
LED drive current	I_{LED}	REC LED			15	mA
[Governor]						
Reference voltage	Vref	Im=100mA	1.1	1.25	1.4	V
Shunt ratio	K	Im=50–100mA	45	50	55	
Residual voltage	Vsat	V_{REF}=V_{CONT}, Im=200mA	0.1	0.2	0.5	V

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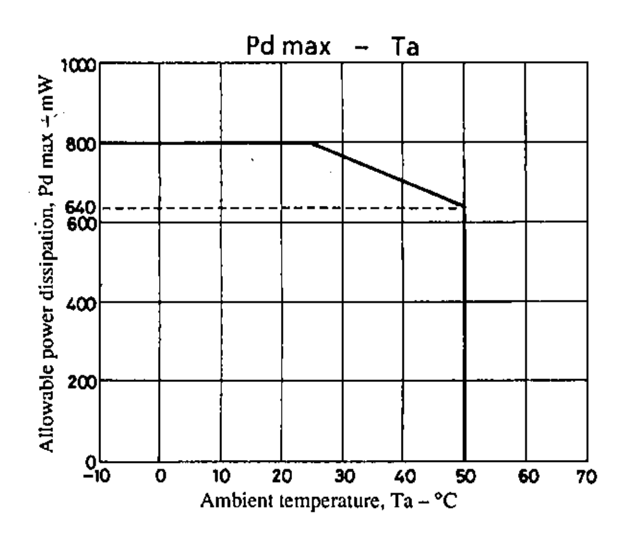
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			min	typ	max	unit
Reference voltage — voltage characteristics	$\frac{\Delta Vref}{Vref}/\Delta V_{CC}$	V_{CC}=1.8 to 4.5V, Im=100mA	0	0.2	0.6	%/V
Shunt voltage ratio — voltage characteristics	$\frac{\Delta K}{K}/\Delta V_{CC}$	V_{CC}=2.0 to 4.5V, Im=50–100mA	0	0.3	0.7	%/V
Reference voltage — current characteristics	$\frac{\Delta Vref}{Vref}/\Delta Im$	Im=50–200mA	0	0.002	0.03	%/mA
Shunt voltage ratio — current characteristics	$\frac{\Delta K}{K}/\Delta Im$	Im=50–100mA to 150–200mA	–0.07	0.03	0.07	%/mA

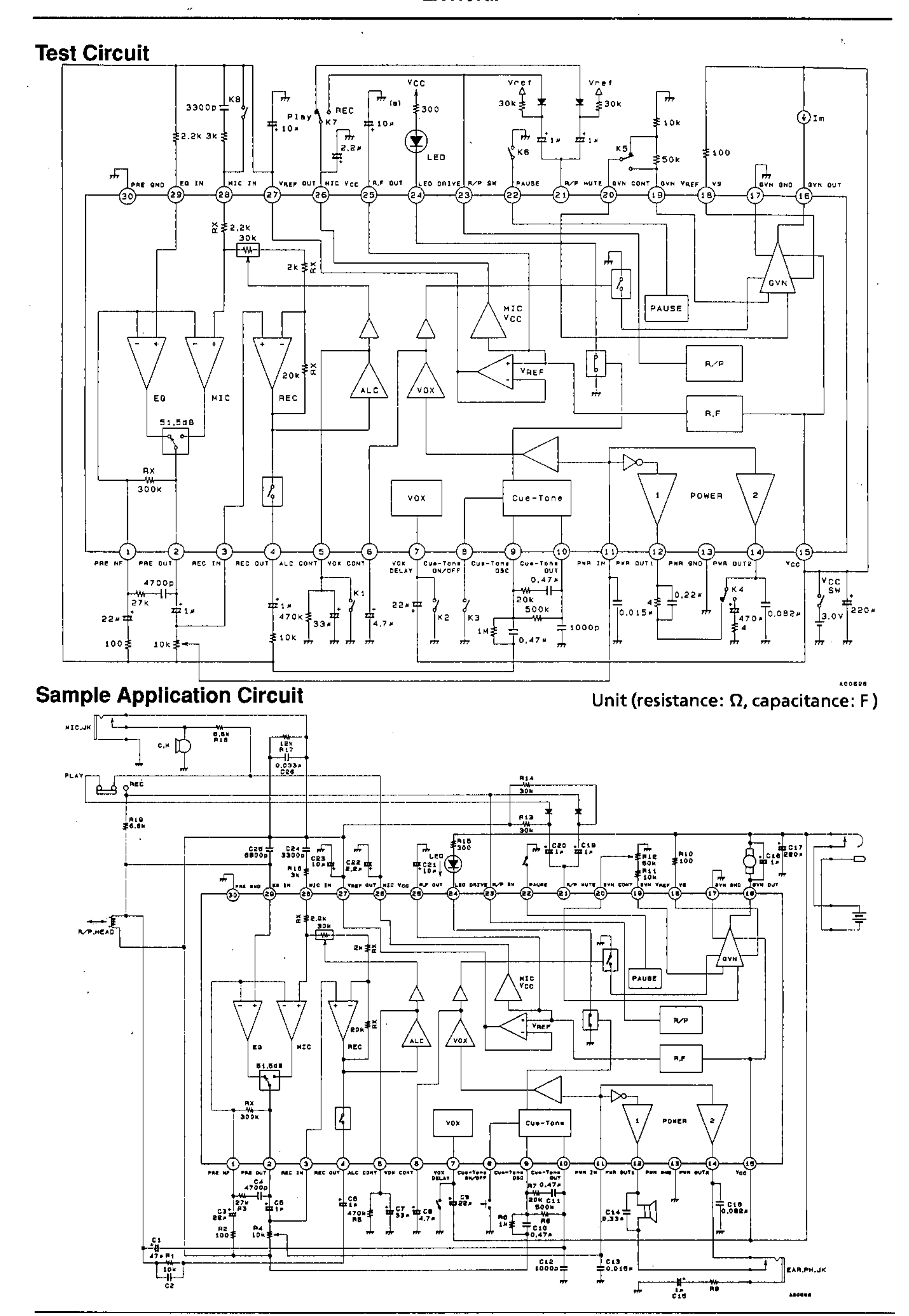
Pin Array and Block Diagram



Unit (resistance: Ω)



Test Circuit



Sample Application Circuit

Unit (resistance: Ω, capacitance: F)

Pin Assignments and Equivalent Circuits

[V_{CC}=3.0V]

Pin No.	Pin name	V_{DC} (V)	Equivalent circuit	Remarks
1	PRE NF	1.5	A00699	NF pin common to preamp and MIC amp
2	PRE OUT	1.5	A00700	Output pin common to preamp and MIC amp
3	REC IN	1.5	A00701	Input for MIC output signal during REC mode
4	REC OUT	1.5	A00702	Pin 23 connected to MIC V_{CC} for recording
5	ALC CONT	0.3to1.1	A00703	ALC operation over 0.65 V
6	VOX CONT	0.3to2.3	A00704	VOX turned on when MIC IN = -90 dB or higher

Unit (resistance: Ω, capacitance: F)

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Pin No.	Pin name	V_{DC} (V)	Equivalent circuit	Remarks
7	VOX DELAY		Vcc, 300k, 20k, 1k, 300, 7, 6.2k, A00705	Turns off VOX at pin 7 GND
8	Cue – Tone ON/OFF		300, 8, A00706	Turns on cue-tone at pin 8 GND
9	Cue – Tone OSC	1.5	9, 300, A00707	• Sets cue-tone frequency • f_{OSC} = 15 Hz at pins 9 and 10, 0.47 µF
10	Cue – Tone OUT	1.5	22k, 10, A00708	• Sets cue-tone frequency • f_{OSC} = 15 Hz at pins 9 and 10, 0.47 µF • Recording at head from pin 10 output
11	PWR IN	1.5	Vref, 30k, 5p, 300, 11, 22k, 5p, A00709	• Power input • Input resistor is 30 kΩ • On-chip anti-buzz capacitor • Input to positive and negative amps with BTL power during PLAY mode
12 14	PWR OUT1 PWR OUT2	1.2 1.2	12, 14, A00710	• Power output 1 (INVERT AMP) • Power output 2 (NON INVERT AMP) • Power output 2 only on during REC mode (single POWER)
13	PWR GND			
15	V_{CC}			

Unit (resistance: Ω, capacitance: F)

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[V_{CC}=3.0V, Im=100mA, R_T=100Ω]

Pin No.	Pin name	V_{DC} (V)	Equivalent circuit	Remarks
16	GVN OUT	0.15to 1.6	16, ZD, 50, 1, A00711	• Connects motor
17	GVN GND			
18	V_S	2.78	18, 2k, 1k, 2k, 10k, GUN OUT, A00712	• Connects at 100Ω to 300Ω, depending on motor characteristics
19	GVN Vref	1.25	19, 5.2k, 10s TR, 560, A00713	• Fixed at 1.25 V with band-gap power supply
20	GVN CONT		20, 300, A00714	• Controls motor speed by resistor

Unit (resistance: Ω, capacitance: F)

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[V_{CC}=3.0V, LED Load 300Ω]

Pin No.	Pin name	V_{DC} (V)	Equivalent circuit	Remarks
21	R/P MUTE	1.5	300, 30k, Vref, A00715	• Turns on mute with application of over 1.6 V when at 3.0 V
22	PAUSE	0.7	300, 50µ, 100, A00716	• Turns off motor (GVN) at pin 22 GND
23	R/P SW	0.7 to 2.65	100k, 1k, 1k, A00717	• Switches to REC mode with pin 23 MIC V_{CC} or to PLAY mode with floating
24	LED DRIVE	0.2	51k, 3k, 50, 51k, A00718	• LED power supply is 10 mA typ., 15 mA max.

Unit (resistance: Ω, capacitance: F)

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[V_{CC}=3.0V]

Pin No.	Pin name	V_{DC} (V)	Equivalent circuit	Remarks
25	R.F OUT	1.5		• R.F OUT = 1.5 V, and can enable SVRR with external capacitor
26	MIC V_{CC}	2.65		• Reference bias for bias, preamp, R/P SW, and Vref
27	V_{REF} OUT	1.5		• Output resistance $r_o \approx 10\ \Omega$
28	MIC IN	1.5		• MIC IN at pin 23 MIC V_{CC} REC state
29	EQ IN	1.5		• EQ IN at pin 23 floating PLAY state
30	PRE GND			

Unit (resistance: Ω, capacitance: F)

Description of Externally Mounted Parts

Part name	Recommended value	Description
C1	47μF to 100μF	Coupling capacitor for f_{OSC} = 15 Hz signal recording head.
C2		Record output bypass capacitor. Varies according to set manufacturer.
C3	22μF to 33μF	NF capacitor for playback preamp and MIC amp. A value higher than recommended will delay playback and MIC amp onset, resulting in a susceptibility to popping at powerup.
C4		Resistor setting EQ curve for playback amp. Varies according to set manufacturer.
C5	0.1μF to 1.0μF	Coupling capacitor for playback preamp to power amp and for MIC amp to REC amp. Preamp output is positive.
C6	0.1μF to 1.0μF	Coupling capacitor for recording signal head. REC amp output is positive.
C7	22μF to 47μF	Capacitor controlling recovery time for ALC.
C8	1μF to 4.7μF	Capacitor controlling VOX attack time. Be aware that an increase in capacitance causes a delay in attack time. C8 / VOX attack time: 1μF — 10ms 4.7μF — 42ms 10μF — 120ms
C9	22μF	Capacitor controlling time constant for continuing to keep governor circuit on even if VOX circuit is switched off. C9 / VOX off time: 1μF — 0.45s 10μF — 2s 22μF — 4.2s
C10, C11		Capacitor controlling cue-tone OSC signal f_{OSC} C10,C11 / f_{OSC}: 0.47μF — Approx. 15Hz 0.15μF + 0.033μF — Approx. 40Hz 0.047μF — Approx. 150Hz
C12	1000pF to 2200pF	Damping capacitor. Ceramic capacitor is recommended.
C13	0.015μF to 0.033μF	Damping capacitor. Film capacitor is recommended.
C14	0.22μF to 0.33μF	Damping capacitor.
C15	0.1μF to 1μF	Earphone output variable capacitor.
C16	0.033μF to 0.068μF	Damping capacitor. Film capacitor is recommended.
C17	220μF	Power supply line decoupling capacitor.
C18	1μF	Load (motor) bypass capacitor.
C19, 20	0.1μF to 1μF	Capacitor controlling muting time.
C21	10μF	Ripple filter capacitor for reference voltage sources MIC V_{CC} pin 26 and V_{REF} pin 27. Be aware that an increase in capacitance causes an increase in the pin 10 and pin 27 smoothing, delaying onset when the power supply is switched on.
C22	2.2μF to 10μF	Decoupling capacitor for reference bias (MIC V_{CC}).
C23	10μF to 22μF	Decoupling capacitor for reference bias (V_{REF}).
C24	3300pF to 4700pF	High-pass capacitor for MIC input.
C25	6800pF	Damping capacitor. Ceramic capacitor is recommended.
C26	0.033μF to 0.068μF	MIC input bias and low-pass capacitor.

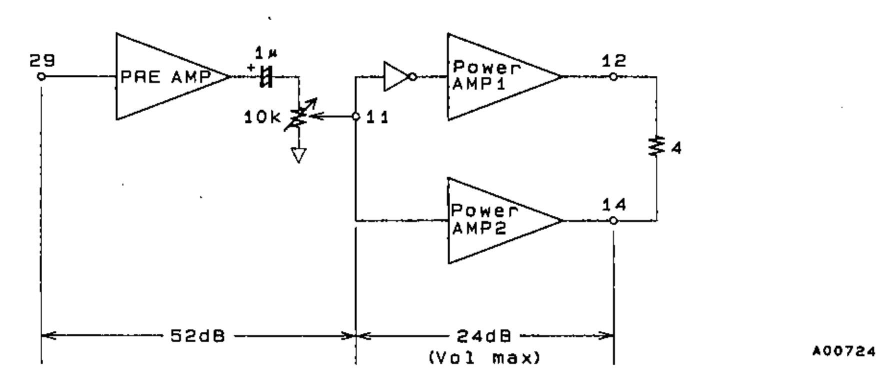
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Part name	Recommended value	Description
R1		Recording amp load resistor. Varies according to set manufacturer, but 10 kΩ is recommended.
R2	100Ω	Controls voltage gain for playback preamp and mike amp. In general usage within the range of 100 to 200Ω is recommended.
R3		EQ constant for playback preamp. Varies according to set manufacturer.
R4	10kΩ	Playback amp load resistor and power input potentiometer.
R5	100kΩ to 1MΩ	Controls ALC attack time.
R6	1MΩ	Low-temperature operation resistor (for bias) when f_{OSC} = 15 Hz.
R7	20kΩ	f_{OSC} operation resistor. Because this oscillates in balance with on-chip resistors, a high-precision resistor is recommended.
R8	500kΩ to 1MΩ	Onset speed-up resistor when f_{OSC} = 15 Hz.
R9	1Ω to 10Ω	Earphone output potentiometer.
R10	100Ω to 300Ω	Varies according to motor characteristics.
R11, R12		Resistor controlling motor speed. Motor speed is adjusted with R11 (fixed) and R12 (variable). Varies according to motor characteristics and set manufacturer.
R13, 14	10kΩ to 30kΩ	Mute bias resistor
R15	100Ω to 300Ω	LED drive current control resistor. LED if off only when cue-tone is on.
R16	3kΩ	Resistor controlling ALC width.
R17	10kΩ to 20kΩ	MIC input bias resistor.
R18	5kΩ to 20kΩ	Controls internal mike output level. Varies according to set manufacturer.
R19	6.8kΩ	Control recording head DC bias current. 6.8Ω is recommended when recording with DC bias system. Be aware that when resistance is high, bias current shows a tendency to diminish, and when resistance is made low, the playback head level is decreased during playback.

IC Usage Cautions and Explanation of Operation

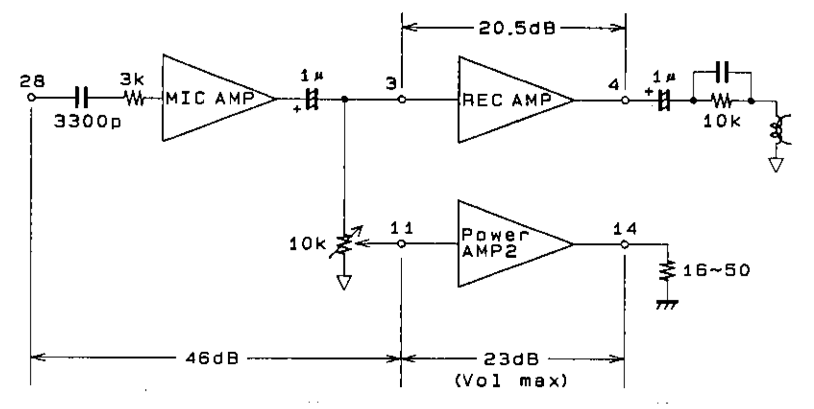
(1) Playback preamp and power amp voltage gain distribution during playback



Unit (resistance: Ω, capacitance: F)

- The voltage gain of the preamp can be adjusted by resistor R2, connected externally. In this case, be aware that varying the voltage gain causes the voltage gain for the playback preamp and the mike amp to be each varied simultaneously.

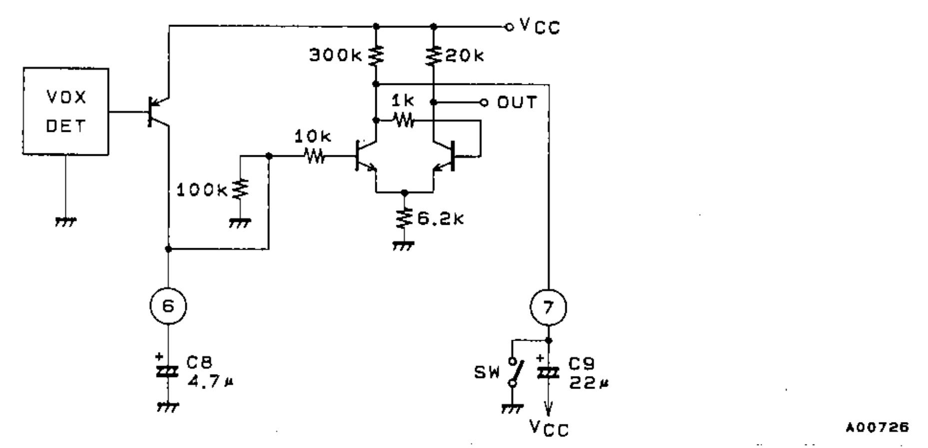
(2) Mike amp, REC amp, and power amp voltage gain distribution during recording



Unit (resistance: Ω, capacitance: F)

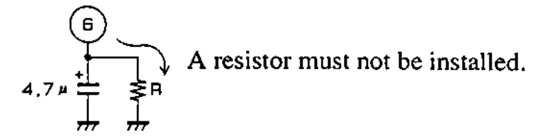
- Be aware that during recording, the power amp is not BTL, and there is single operation for only power amp 2.

(3) VOX circuit (VOX equivalent circuit)



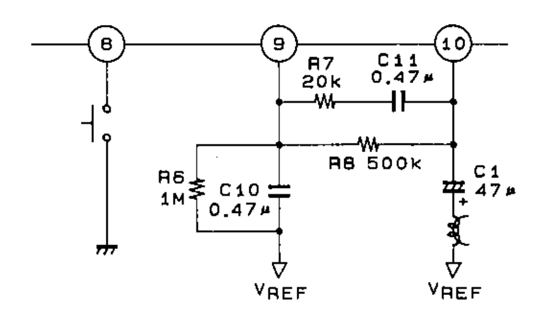
Unit (resistance: Ω, capacitance: F)

- VOX on time can be adjusted by varying C8 at pin 6. Increasing the capacitance delays attack time, and reducing capacitances hastens it (VOX on = Approx. 40 ms when C8 = 4.7 μF and C9 = 22 μF).
- VOX off time can be adjusted by varying C9 at pin 7 (VOX off = Approx. 4s when C8 = 4.7 μF and C9 = 22 μF).
- To continue VOX circuit operation when MIC input is below the specified level, increase the capacitance of the capacitor between pin 7 and V_{CC}.
- To keep the governor circuit on after the VOX circuit is switched off, turn on the switch and ground pin 7 in the equivalent circuit shown above.
- Only a capacitor is mounted between pin 6 and ground. A resistor is not mounted because when the VOX circuit is turned on, a minute charging current is present at pin 6, and the resistance would bypass this minute current, causing a delay in operation and, in the worst case, failure of the VOX circuit to operate.



- The VOX circuit has a hysteresis width of approximately 6 dB. But as shown in the figure above, the VOX circuit is switched on when the voltage at pin 6 is over approximately 1.3 V, and is switched off when voltage is below approximately 0.7 V. The bias to keep the VOX circuit on at this time must be an average or smooth voltage over approximately 0.75 V.

(4) Cue-tone (externally mounted cue-tone circuit)

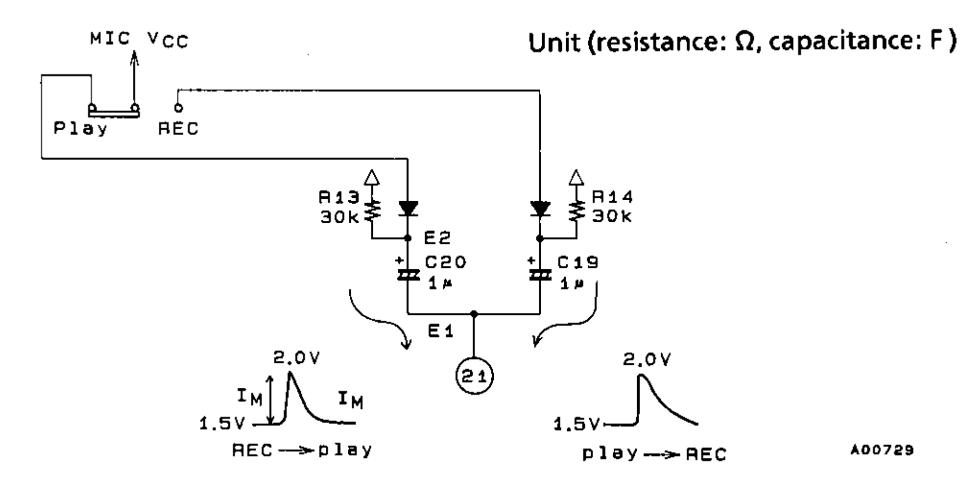


Unit (resistance: Ω, capacitance: F)

- Cue-tone begins to operate at the pin 8 ground, as shown in the figure above. The LED goes out at this time.
- Capacitors C10 and C11 for cue-tone operation must be of high quality and of identical precision.
- Capacitors C10 and C11 can be varied to change the cue-tone frequency. Increasing the capacitance of C10 and C11 delays the frequency, and decreasing this capacitance hastens it. In the external circuit shown above, f_{OSC} = Approx. 15 Hz.

(5) R/P mute (mute circuit during R/P switching)

Unit (resistance: Ω, capacitance: F)



- In the mute circuit depicted above, a minute pulse is input to pin 21 as shown in the figure to switch from REC to PLAY or from PLAY to REC. At this time, current is determined by:

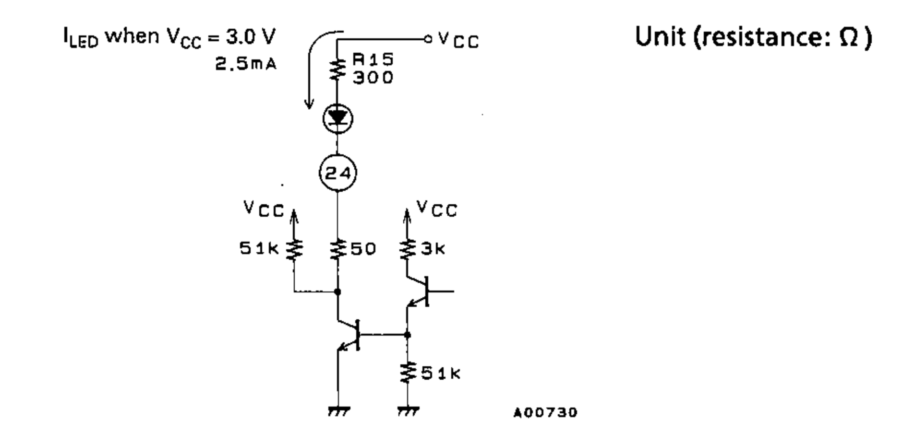
$$I_M = \frac{E_2 - E_1}{R13}$$

In this case,

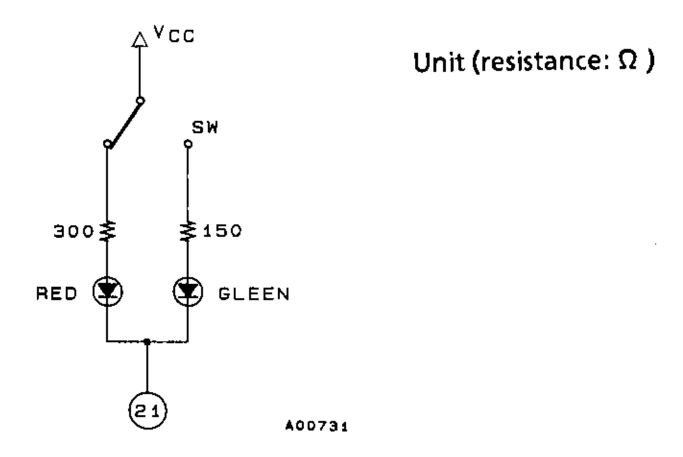
$$I_M = \frac{2.0V - 1.5V}{30k\Omega} = 16.7\mu A$$

- Muting capacitors C19 and C20 are used to adjust the muting time: muting time increases when capacitance is high and decreases when capacitance is low. Be aware, however, that if capacitance is excessive, power amp onset is delayed when V_{CC} is on. Capacitance of 0.1 μF to 1 μF is recommended.
- If voltage over 1.6 V is applied to the mute pin when V_{CC} = 3.0 V, each amp is muted. Be aware that application of voltage higher than V_{CC} in this case will disable muting.
- The power, REC, VOX, and ALC amps can be muted.

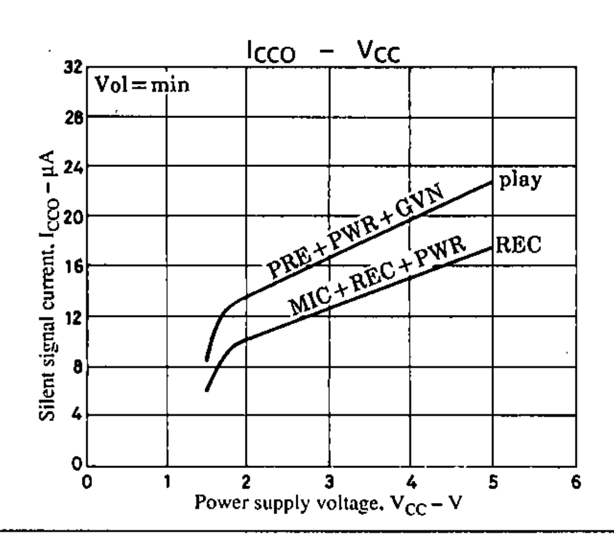
(6) LEDs

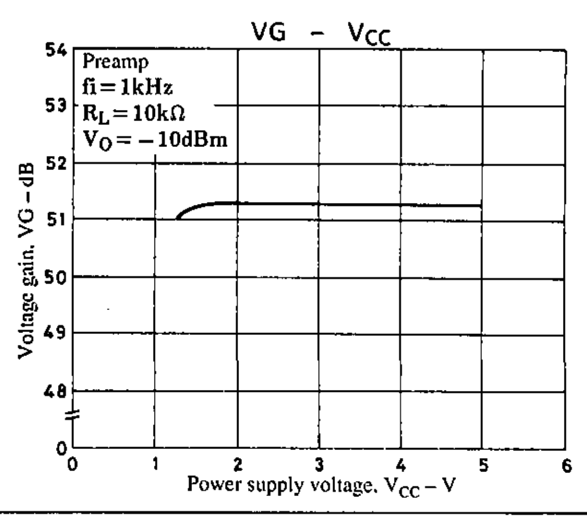


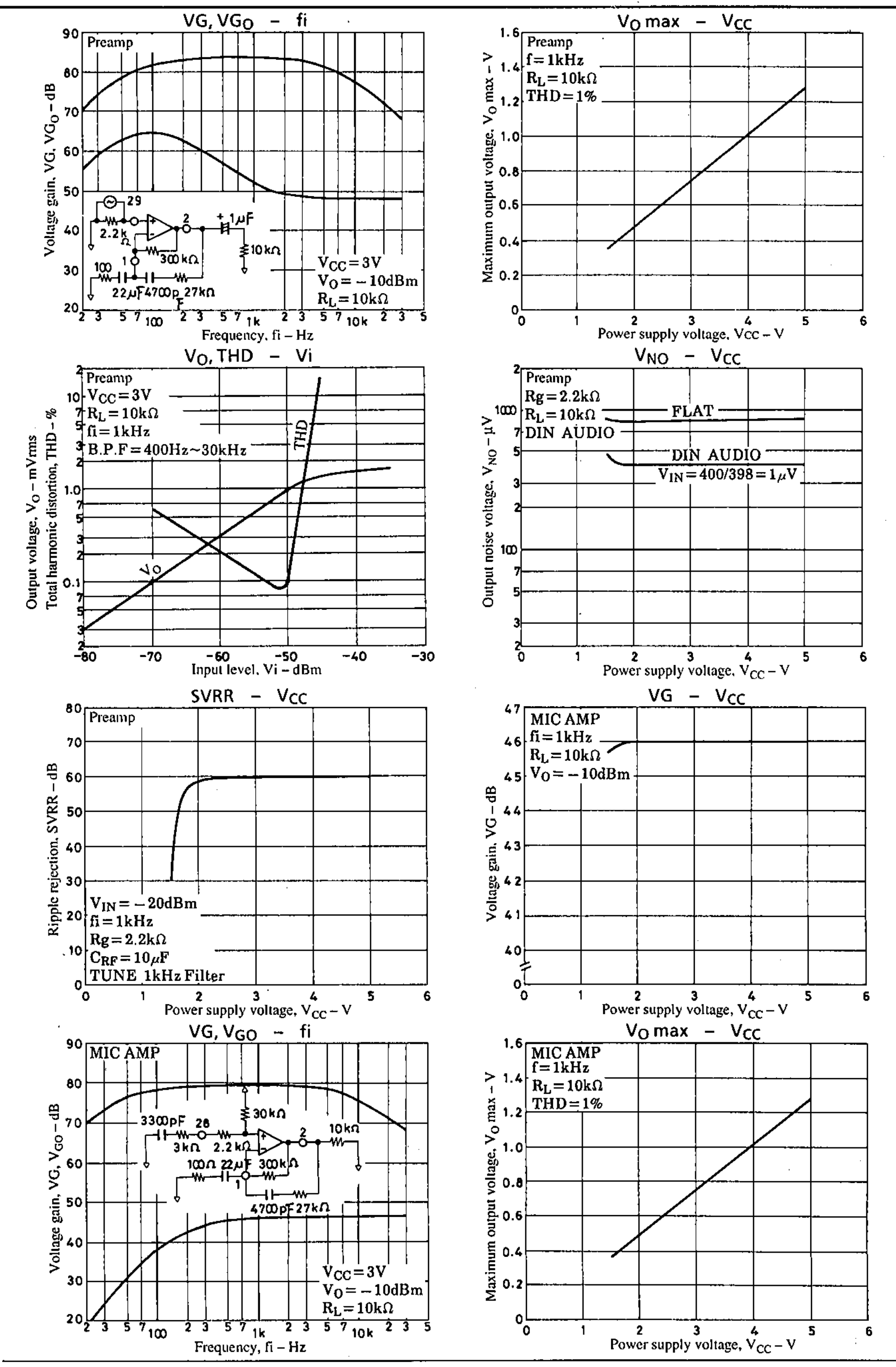
- Pin 24 is dedicated to LED use. The LED is lit during normal operation, and goes out only when cue-tone is on in the recording mode.
- With 10 mA typ. at 3.0 V for I_{LED} at the LED pin, it is possible to switch between red and green LEDs as shown in the diagram below.

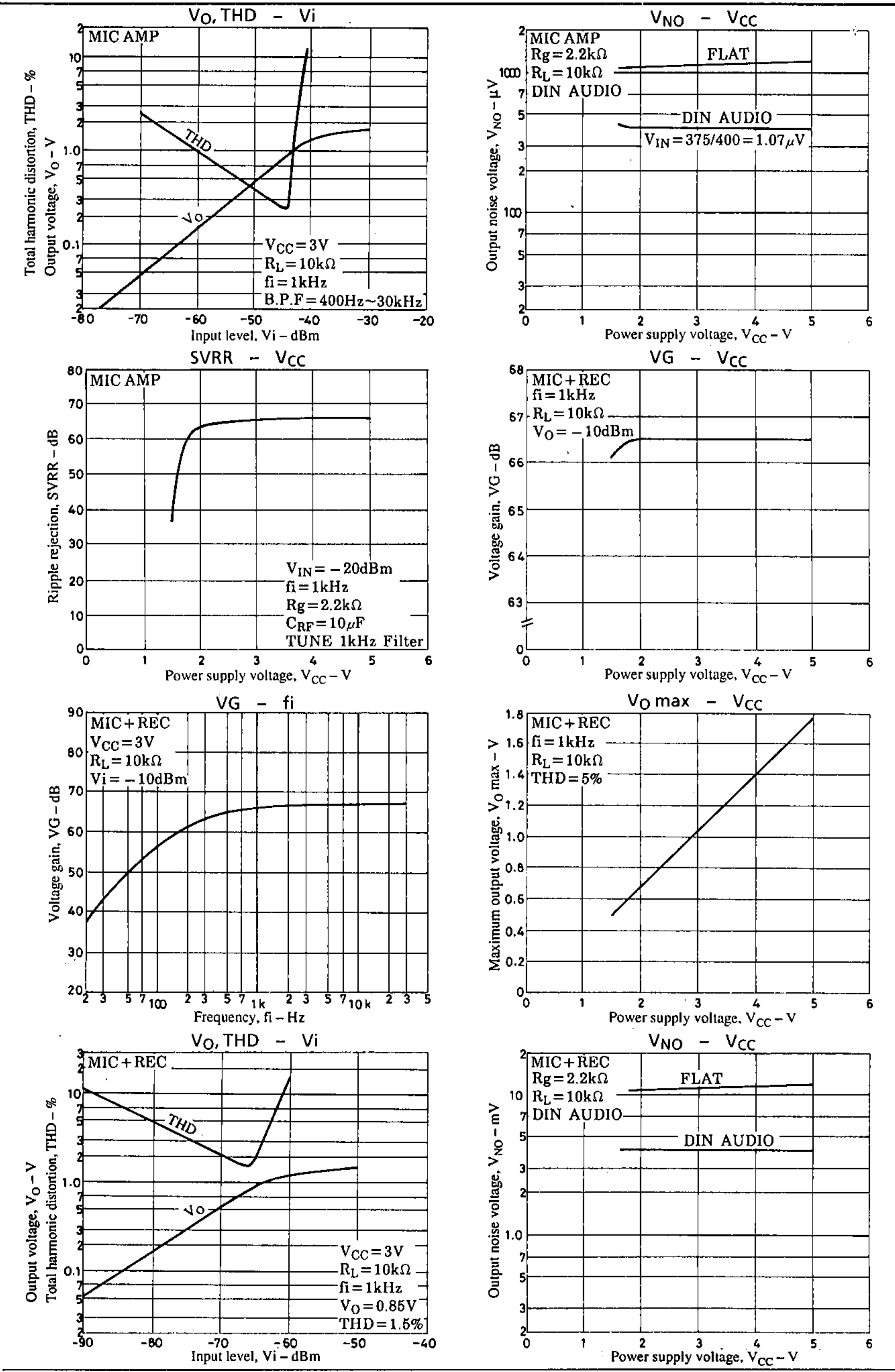


- The LED pin should be left open if not used.

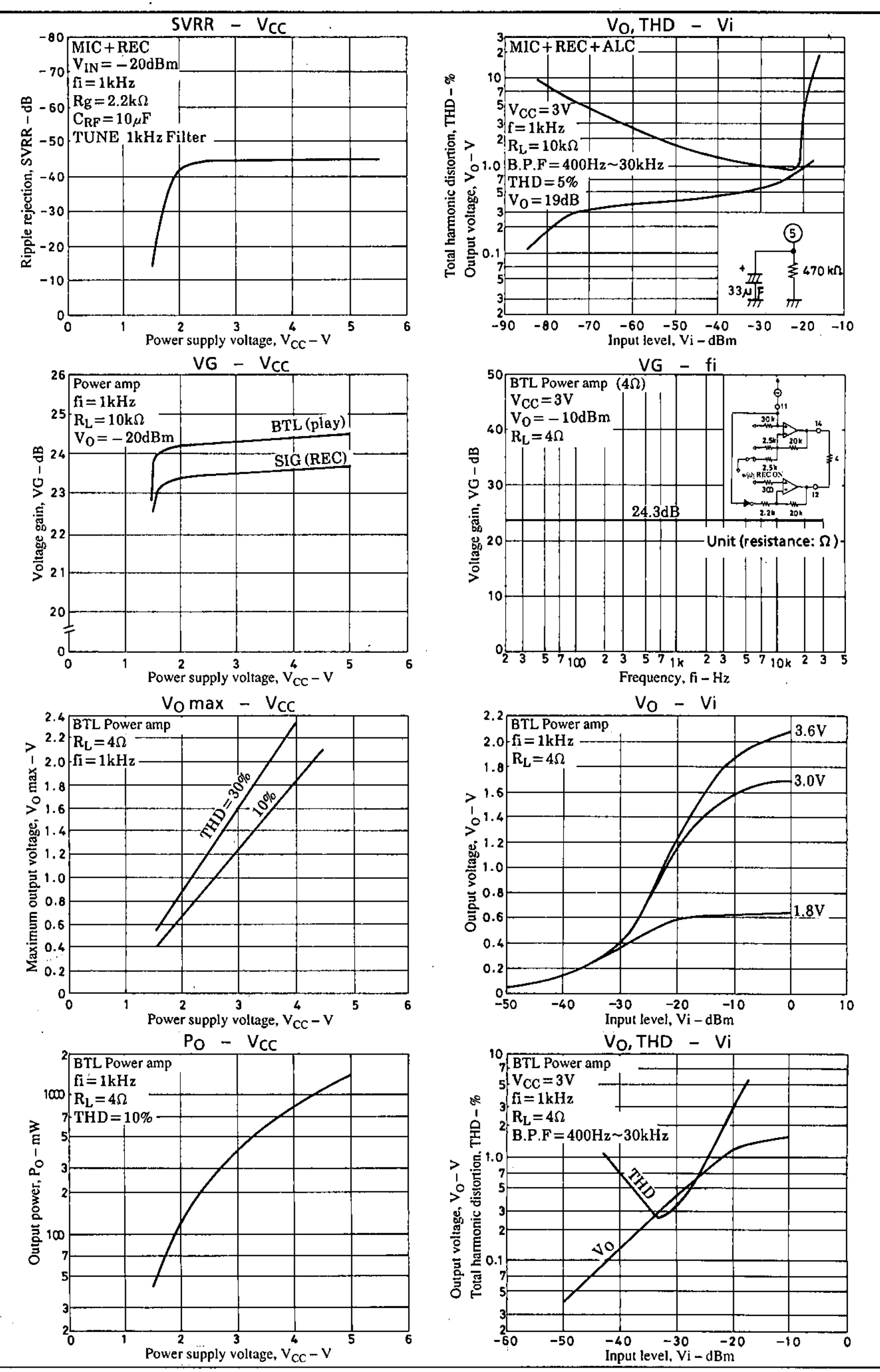


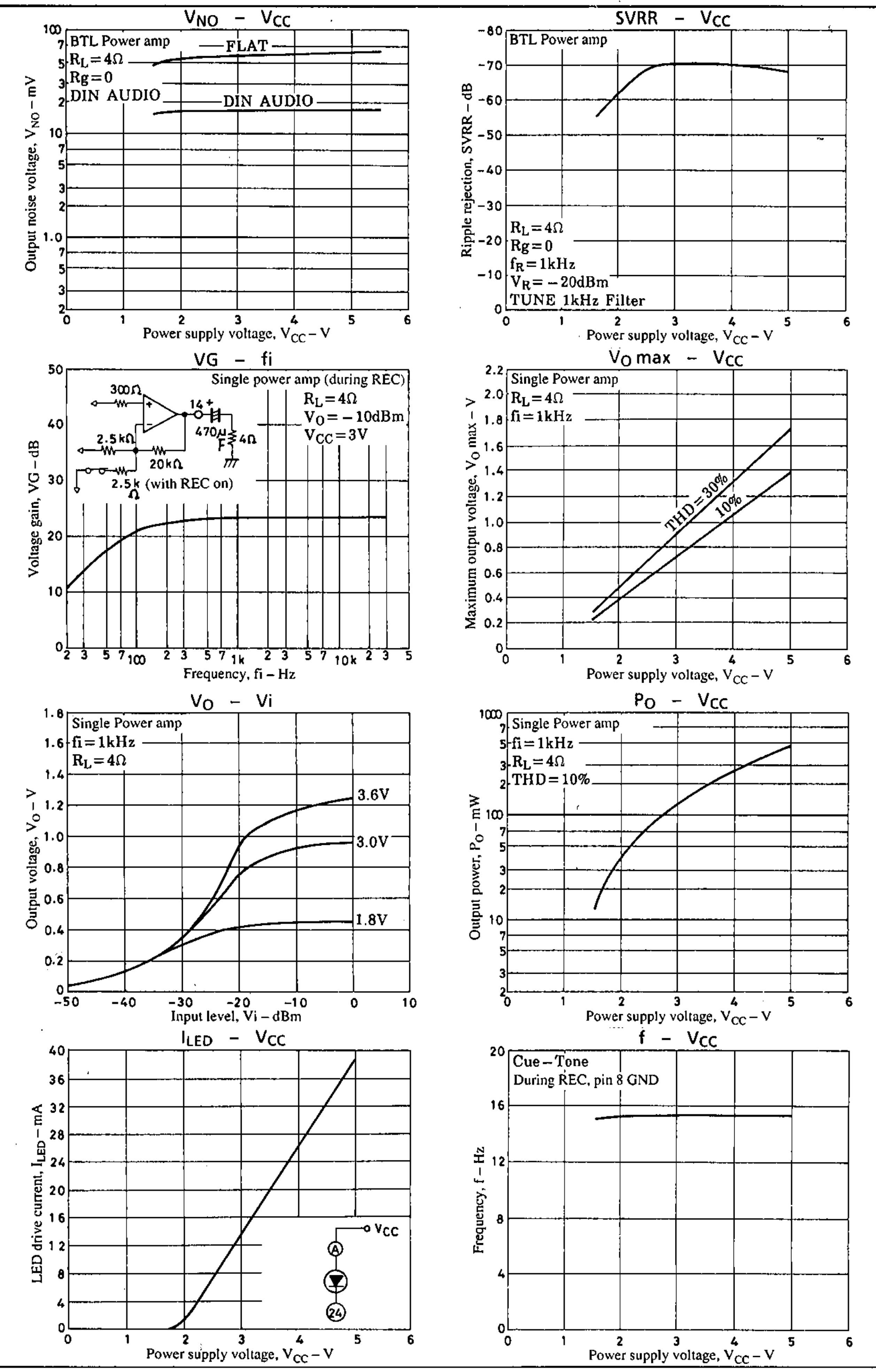



VG, VGo – fi
Preamp
Voltage gain, VG, VGo – dB
Frequency, fi – Hz
VCC=3V
VO=–10dBm
RL=10kΩ
2.2kΩ
300kΩ
1μF
10kΩ
100
22μF
4700p
27kΩ
Vo max – VCC
Preamp
f=1kHz
RL=10kΩ
THD=1%
Maximum output voltage, Vo max – V
Power supply voltage, Vcc – V
Vo, THD – Vi
Preamp
VCC=3V
RL=10kΩ
fi=1kHz
B.P.F=400Hz~30kHz
THD
Vo
Output voltage, Vo – mVrms
Total harmonic distortion, THD – %
Input level, Vi – dBm
VNO – VCC
Preamp
Rg=2.2kΩ
RL=10kΩ
DIN AUDIO
FLAT
DIN AUDIO
VIN=400/398=1μV
Output noise voltage, VNO – μV
Power supply voltage, VCC – V
SVRR – VCC
Preamp
VIN=–20dBm
fi=1kHz
Rg=2.2kΩ
CRF=10μF
TUNE 1kHz Filter
Ripple rejection, SVRR – dB
Power supply voltage, VCC – V
VG – VCC
MIC AMP
fi=1kHz
RL=10kΩ
VO=–10dBm
Voltage gain, VG – dB
Power supply voltage, VCC – V
VG, VGO – fi
MIC AMP
3300pF
3kΩ
2.2kΩ
30kΩ
10kΩ
100Ω
22μF
300kΩ
4700pF
27kΩ
VCC=3V
VO=–10dBm
RL=10kΩ
Voltage gain, VG, VGO – dB
Frequency, fi – Hz
Vo max – VCC
MIC AMP
f=1kHz
RL=10kΩ
THD=1%
Maximum output voltage, Vo max – V
Power supply voltage, VCC – V

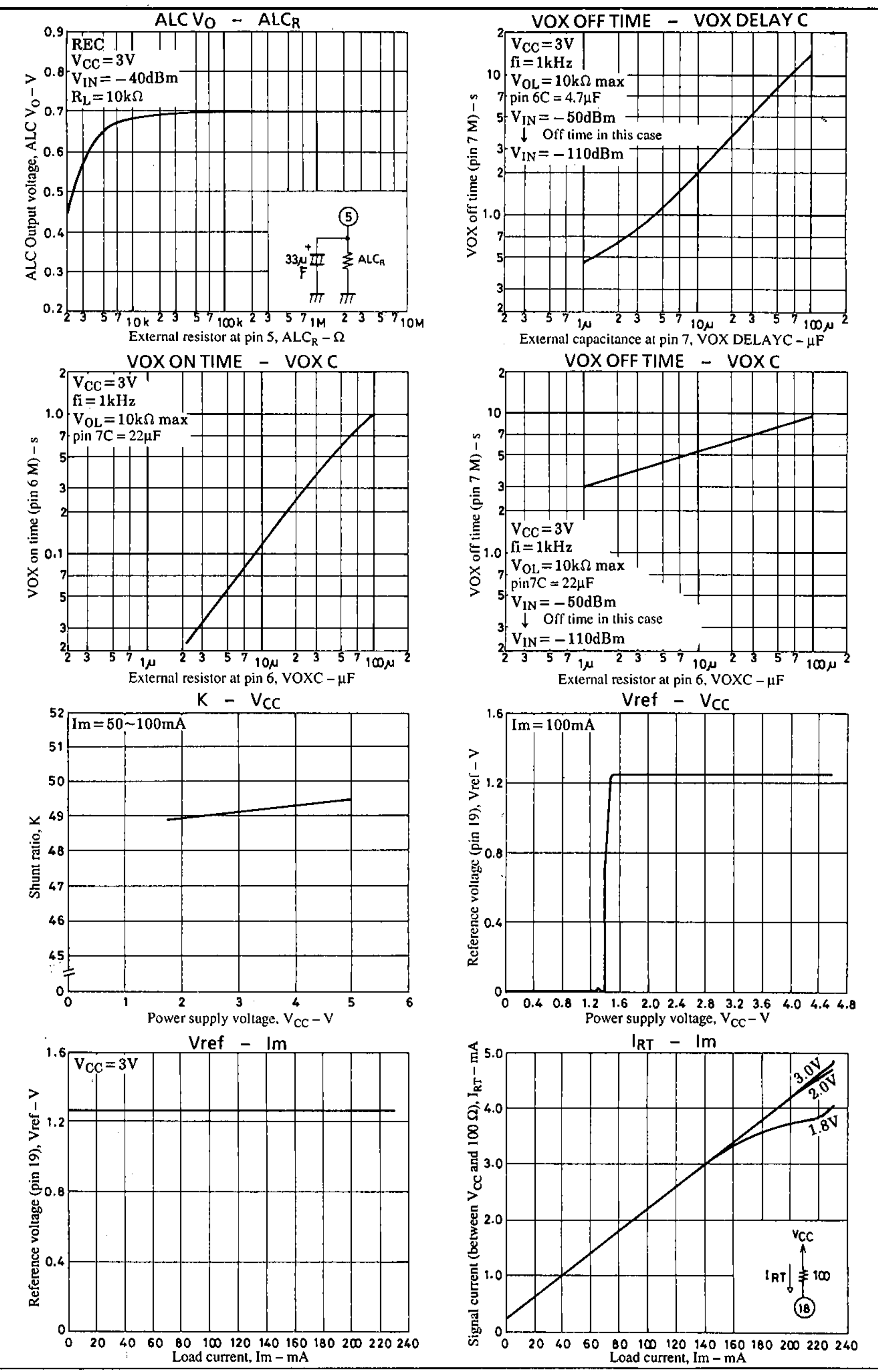


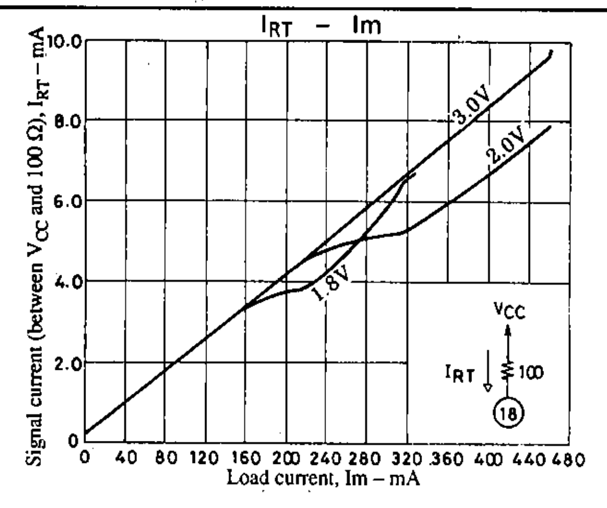
VO, THD – Vi
MIC AMP
THD
Vo
VCC=3V
RL=10kΩ
fi=1kHz
B.P.F=400Hz~30kHz
Total harmonic distortion, THD – %
Output voltage, VO – V
Input level, Vi – dBm
VNO – VCC
MIC AMP
Rg=2.2kΩ
RL=10kΩ
DIN AUDIO
FLAT
DIN AUDIO
VIN=375/400=1.07μV
Output noise voltage, VNO – μV
Power supply voltage, VCC – V
SVRR – VCC
MIC AMP
VIN=–20dBm
fi=1kHz
Rg=2.2kΩ
CRF=10μF
TUNE 1kHz Filter
Ripple rejection, SVRR – dB
Power supply voltage, VCC – V
VG – VCC
MIC+REC
fi=1kHz
RL=10kΩ
VO=–10dBm
Voltage gain, VG – dB
Power supply voltage, VCC – V
VG – fi
MIC+REC
VCC=3V
RL=10kΩ
Vi=–10dBm
Voltage gain, VG – dB
Frequency, fi – Hz
VO max – VCC
MIC+REC
fi=1kHz
RL=10kΩ
THD=5%
Maximum output voltage, VO max – V
Power supply voltage, VCC – V
VO, THD – Vi
MIC+REC
THD
Vo
VCC=3V
RL=10kΩ
fi=1kHz
VO=0.85V
THD=1.5%
Output voltage, VO – V
Total harmonic distortion, THD – %
Input level, Vi – dBm
VNO – VCC
MIC+REC
Rg=2.2kΩ
RL=10kΩ
DIN AUDIO
FLAT
DIN AUDIO
Output noise voltage, VNO – mV
Power supply voltage, VCC – V

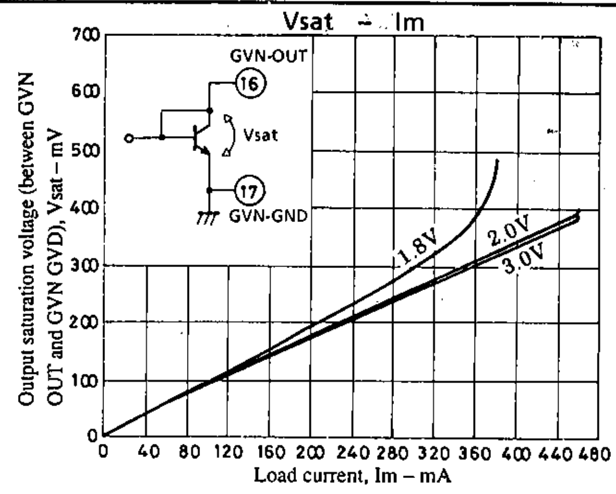

SVRR – VCC
MIC+REC
VIN=–20dBm
fi=1kHz
Rg=2.2kΩ
CRF=10μF
TUNE 1kHz Filter
Ripple rejection, SVRR – dB
Power supply voltage, VCC – V
VO, THD – Vi
MIC+REC+ALC
VCC=3V
f=1kHz
RL=10kΩ
B.P.F=400Hz~30kHz
THD=5%
VO=19dB
33μF
470 kΩ
Total harmonic distortion, THD – %
Output voltage, VO – V
Input level, Vi – dBm
VG – VCC
Power amp
fi=1kHz
RL=10kΩ
VO=–20dBm
BTL (play)
SIG (REC)
Voltage gain, VG – dB
Power supply voltage, VCC – V
VG – fi
BTL Power amp (4Ω)
VCC=3V
VO=–10dBm
RL=4Ω
24.3dB
Unit (resistance: Ω)
Voltage gain, VG – dB
Frequency, fi – Hz
VO max – VCC
BTL Power amp
RL=4Ω
fi=1kHz
THD=30%
10%
Maximum output voltage, VO max – V
Power supply voltage, VCC – V
VO – Vi
BTL Power amp
fi=1kHz
RL=4Ω
3.6V
3.0V
1.8V
Output voltage, VO – V
Input level, Vi – dBm
PO – VCC
BTL Power amp
fi=1kHz
RL=4Ω
THD=10%
Output power, PO – mW
Power supply voltage, VCC – V
VO, THD – Vi
BTL Power amp
VCC=3V
fi=1kHz
RL=4Ω
B.P.F=400Hz~30kHz
THD
VO
Output voltage, VO – V
Total harmonic distortion, THD – %
Input level, Vi – dBm

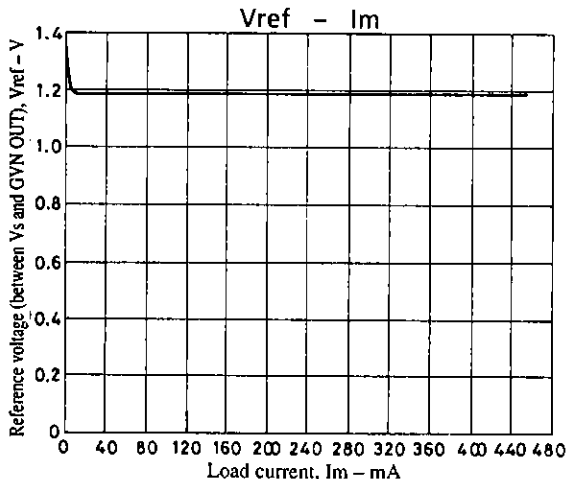


VNO - VCC
BTL Power amp
RL=4Ω
Rg=0
DIN AUDIO
FLAT
DIN AUDIO
Output noise voltage, VNO - mV
Power supply voltage, VCC - V
SVRR - VCC
BTL Power amp
RL=4Ω
Rg=0
fR=1kHz
VR=-20dBm
TUNE 1kHz Filter
Ripple rejection, SVRR - dB
Power supply voltage, VCC - V
VG - fi
Single power amp (during REC)
RL=4Ω
VO=-10dBm
VCC=3V
300Ω
2.5kΩ
20kΩ
2.5k (with REC on)
Ω
14
470μ
F
4Ω
Voltage gain, VG - dB
Frequency, fi - Hz
VO max - VCC
Single Power amp
RL=4Ω
fi=1kHz
THD=30%
10%
Maximum output voltage, VO max - V
Power supply voltage, VCC - V
VO - Vi
Single Power amp
fi=1kHz
RL=4Ω
3.6V
3.0V
1.8V
Output voltage, VO - V
Input level, Vi - dBm
PO - VCC
Single Power amp
fi=1kHz
RL=4Ω
THD=10%
Output power, PO - mW
Power supply voltage, VCC - V
ILED - VCC
VCC
A
24
LED drive current, ILED - mA
Power supply voltage, VCC - V
f - VCC
Cue-Tone
During REC, pin 8 GND
Frequency, f - Hz
Power supply voltage, VCC - V


ALC VO - ALCR
REC
VCC=3V
VIN=-40dBm
RL=10kΩ
ALC Output voltage, ALC VO - V
External resistor at pin 5, ALCR - Ω
33μF
ALCR
VOX OFF TIME - VOX DELAY C
VCC=3V
fi=1kHz
VOL=10kΩ max
pin 6C = 4.7μF
VIN=-50dBm
Off time in this case
VIN=-110dBm
VOX off time (pin 7 M) - s
External capacitance at pin 7, VOX DELAYC - μF
VOX ON TIME - VOX C
VCC=3V
fi=1kHz
VOL=10kΩ max
pin 7C = 22μF
VOX on time (pin 6 M) - s
External resistor at pin 6, VOXC - μF
VOX OFF TIME - VOX C
VCC=3V
fi=1kHz
VOL=10kΩ max
pin7C = 22μF
VIN=-50dBm
Off time in this case
VIN=-110dBm
VOX off time (pin 7 M) - s
External resistor at pin 6, VOXC - μF
K - VCC
Im=50~100mA
Shunt ratio, K
Power supply voltage, VCC - V
Vref - VCC
Im=100mA
Reference voltage (pin 19), Vref - V
Power supply voltage, VCC - V
Vref - Im
VCC=3V
Reference voltage (pin 19), Vref - V
Load current, Im - mA
IRT - Im
3.0V
2.0V
1.8V
VCC
IRT
100
Signal current (between VCC and 100 Ω), IRT - mA
Load current, Im - mA


IRT - Im
Signal current (between VCC and 100 Ω), IRT – mA
Load current, Im – mA
3.0V
2.0V
1.8V
VCC
IRT
100
18


Vsat - Im
Output saturation voltage (between GVN OUT and GVN GVD), Vsat – mV
Load current, Im – mA
GVN-OUT
16
Vsat
17
GVN-GND
1.8V
2.0V
3.0V


Vref - Im
Reference voltage (between Vs and GVN OUT), Vref – V
Load current, Im – mA